United States Patent

Schmiedberg

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[54] ROLL ASSEMBLY EXTRACTOR FOR A ROLLING MILL

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[30] **Foreign Application Priority Data**

Nov. 25, 1968 Great Britain 55,767/68

[52] **U.S. Cl.** **72/239**

[51] **Int. Cl.** **B21b 31/10**

[58] **Field of Search** 72/237, 238, 239

[56] **References Cited**

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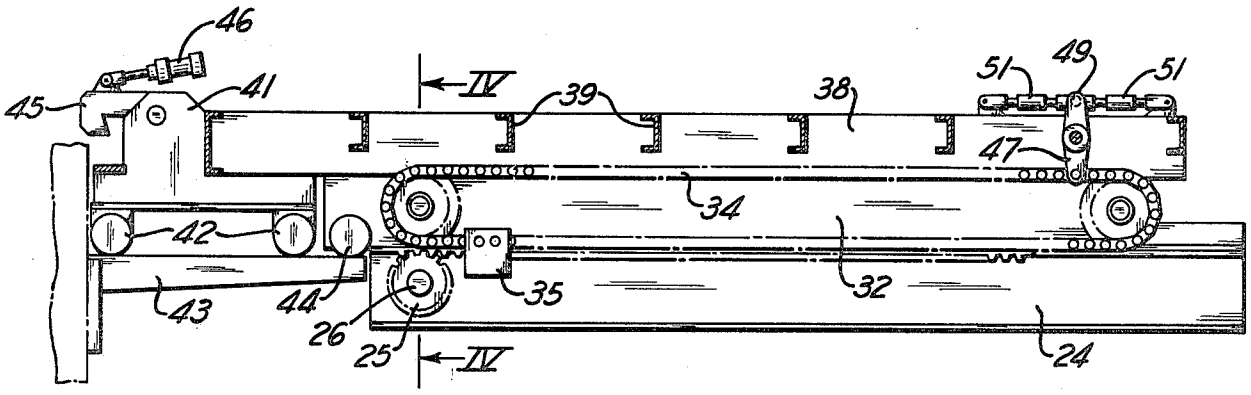
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[57] **ABSTRACT**

The present disclosure relates to a roll assembly extractor for a rolling mill which includes three superimposed rams, the upper one being supported by a middle one and caused to move relative to the roll assembly and the middle ram supported by a lower ram and movable relative thereto towards the roll assembly. The upper ram includes a hook for connecting the ram to the roll assembly. The middle arm is advanced by a rack and pinion and carries a chain which is connected to the upper ram for advancing this ram.

7 Claims, 4 Drawing Figures



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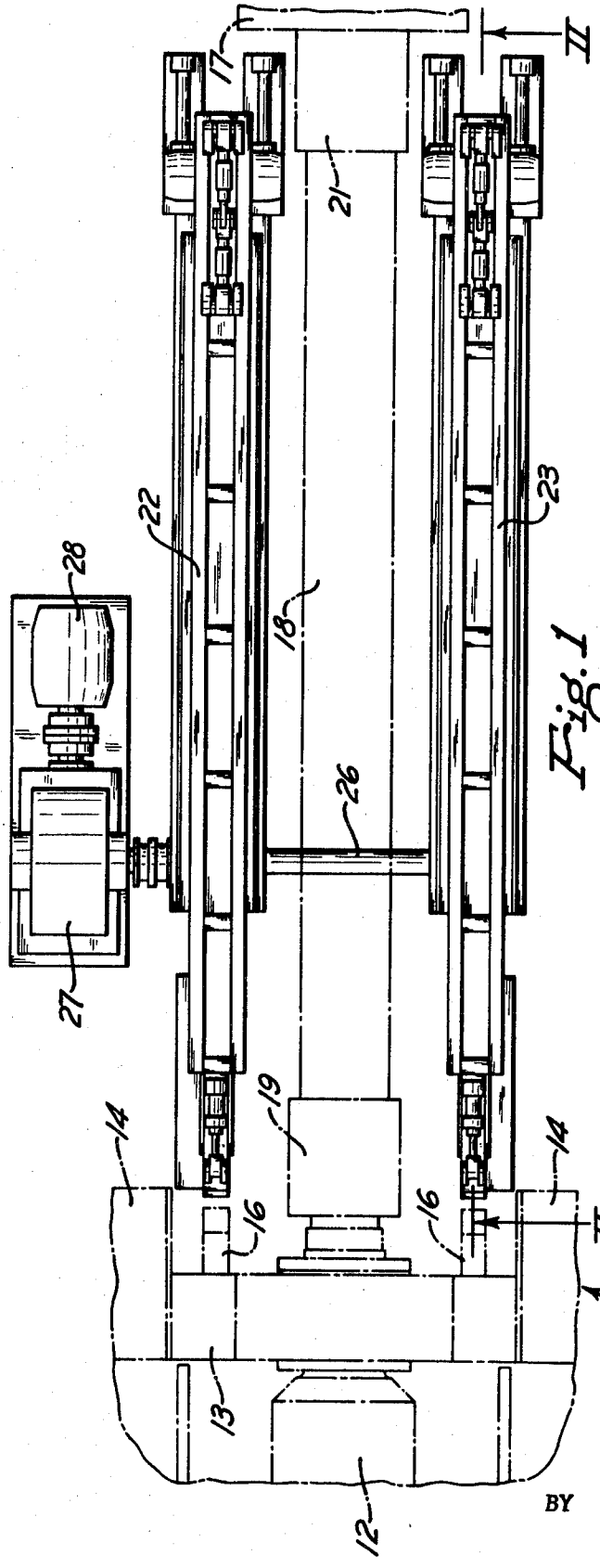


Fig. 1

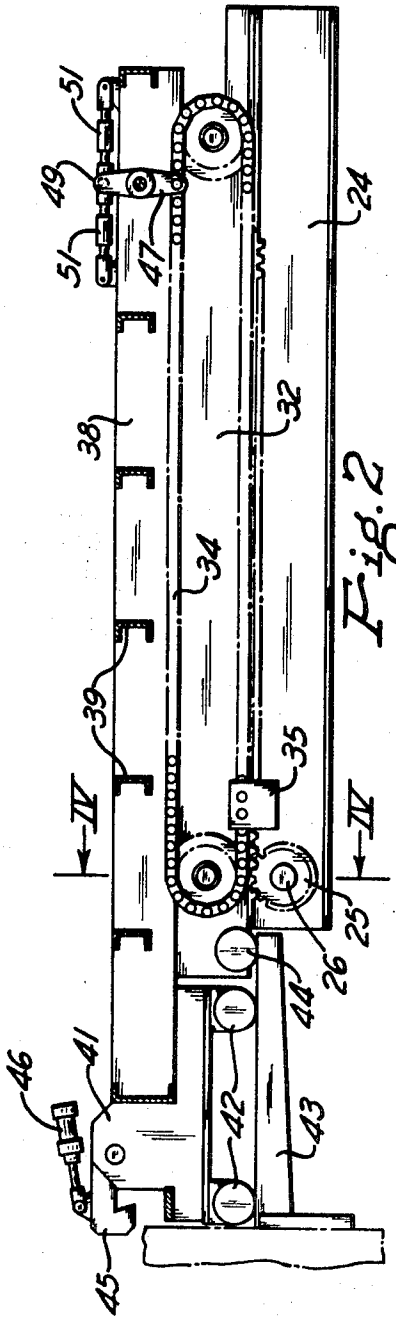


Fig. 2

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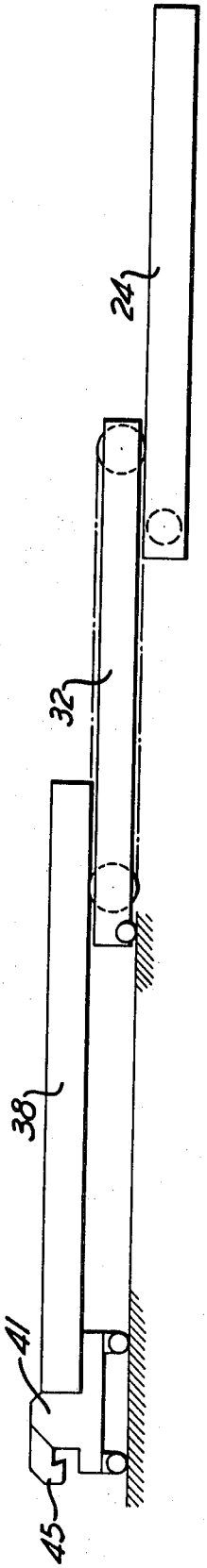


Fig. 3

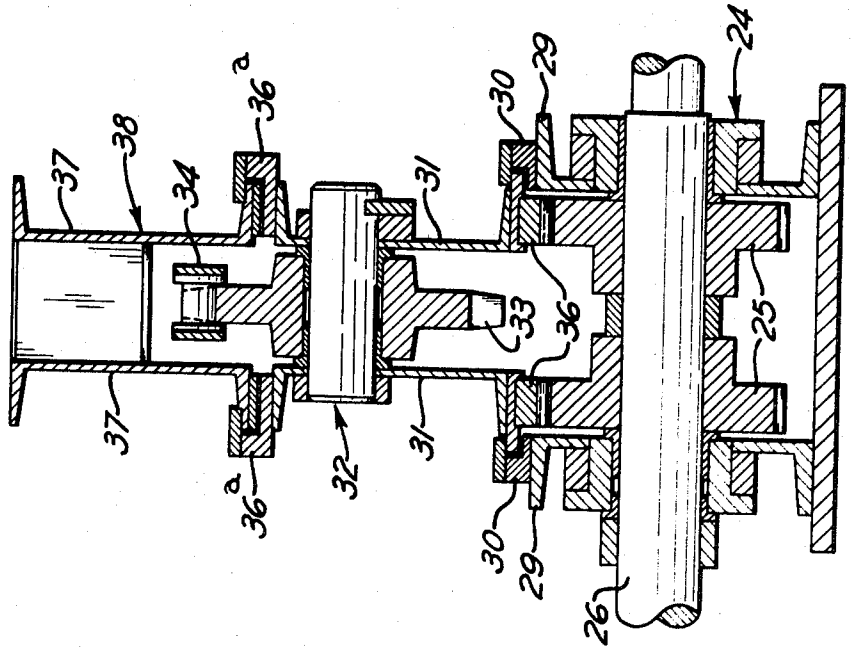


Fig. 4

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ROLL ASSEMBLY EXTRACTOR FOR A ROLLING MILL

It has been recently a common practice to provide in connection with the finishing trains of hot strip mills and cold mills an automatic roll changing system which, in many forms, includes a means located at the drive side for extracting the rolls from the mill and inserting a new pair of rolls into the mill. An example of such a device is illustrated in U.S. Pat. No. 3,208,260 which issued to M. P. Sieger et al., on Sept. 28, 1965.

With reference to the relatively long distance that the extractor must advance the rolls from the mill into a position in front of the mill, it has been necessary heretofore to provide a special construction at the drive side of the mill to accommodate the travel necessary for the power means that advance the extractor. The power means have taken the form of either piston cylinder assemblies or of a rack and pinion in which, in both cases, it was necessary if a pinion stand was being employed to alter the design of the pinion stand, say, for example, to provide for the rams of the rack and pinion driving arrangement to pass through the pinion stand. In this connection such a construction is shown in FIGS. 1 and 2 of the aforesaid Sieger et al. patent.

Such an alteration of the drive for the rolling mill is, however, very costly and hence there has been a need for an improved extractor arrangement that will be small enough to fit between the mill stand and the drive.

It is, therefore, an object of the present invention to provide an extractor for use in connection with the removal of rolls from the rolling mill which will fit between the rolling mill stand and its drive.

More particularly, it is the object of the present invention to provide an extractor which comprises a plurality of superimposed rams constructed in a way that the rams move relative to each other in a telescoping fashion, drive means for advancing the rams and means for connecting the rams to the rolls so that the rams may extract and insert a roll assembly from and into the mill.

It is a further object of the present invention to provide in a roll assembly ejector arrangement three superimposed rams, a lower stationarily mounted one being designed to support a middle ram provided with a driven pinion which drives a rack mounted on the middle ram. The middle ram also comprises a pair of sprockets on which is carried a chain, the opposite ends of the chain being connected to the lower ram. The third ram is carried by the middle ram and it is also connected to the chain and has at its ends adjacent the roll assembly a carriage which includes a pivotal hook adapted to engage the roll assembly.

These objects, as well as other novel features and advantages of the invention may be better understood when the following description is read along with the accompanying drawings of which:

FIG. 1 is a plan view of a roll extractor built in accordance with the present invention showing its relationship to the mill stand and a pinion stand;

FIG. 2 is a sectional view of the roll extractor illustrated in FIG. 1 taken on lines II—II of FIG. 1;

FIG. 3 is a diagrammatical expanded view of the extractor shown in FIGS. 1 and 2; and

FIG. 4 is a sectional view taken on lines III—III of FIG. 2.

With reference to FIG. 1, there is shown in outline form a rolling mill 11 having a pair of work roll assemblies, one being shown at 12. These assemblies consist of a work roll, each having interfitting bearing chock assemblies, one being shown at 13, which allows the roll assemblies to be extracted from the mill as a unit. The chock 13, which in this case is the lower chock, extends between the housing post 14 of the rolling mill. Projecting outward from the chock there is provided a pair of hooks 16, the purpose of which will be explained later. To the right of the mill there is also shown in outline form the pinion stand 17 which drives the work roll 12 by a spindle 18 through couplings 19 and 21. In the space provided between the mill 11 and the pinion stand 17, as defined by the spindle 18, there is provided the roll assembly extracting device of the present invention.

As noted in FIG. 1, it takes the form of two identical extractor assemblies 22 and 23 arranged on either side of the spindle and in view of this identity, only one of the assemblies will be specifically described. With reference to FIG. 2 it will be seen that the ejector 23 comprises a lower first ram 24 which is stationarily mounted and includes at its one end a pair of pinions 25. The pinions are driven by a shaft 26 which is, in turn, connected to a gear reduction unit 27 which is driven by a motor 28. It will, of course, be understood that the pinions associated with the other extractor assembly 22 are also driven by the shaft 26 in unison with the pinion 25.

In now referring to FIG. 4, it will be noted that the ram 24 takes the form of two opposed channels 29 and at their upper surfaces they are provided with parallel guides 30 which receive the bottom member of a second pair of opposed channels 31 that make up the second or middle ram 32. The channel members 31 of the ram 32 therefore are supported by and guided in the lower ram 24. The ram 32 is about the same length as the lower ram 24 and on its ends there are mounted sprockets 33 which carry a chain 34. As noted in FIG. 2, the opposite ends of the chain are connected to a plate 35 which, in turn, is connected to the stationary lower ram 24. Two racks 36 mounted at the base of the ram mesh with the pinion 25.

The middle ram 32 is also provided with parallel guides 36*a* which receive the lower portion of a pair of channel beams 37 that form part of the third or upper ram 38. The upper ram 38 includes crossbeams 39 which are provided for rigidity, similar beams being provided in connection with the other two rams, although not specifically shown. At the roll assembly side of the ram 38, there is provided a carriage 41 which consists of a pair of wheels 42 that roll over a track 43. The track also supports a wheel 44 which is mounted at the front of the middle ram 32.

In referring again to the carriage 41, at the top there is provided a pivotally mounted hook 45, the hook being raised and lowered by a piston cylinder assembly 46 also carried by the carriage. At the other end of the upper ram 38 there is provided a link 47, one end being connected to the chain 34 and the other end to an adjustable turnbuckle assembly 49. This assembly comprises a threaded shaft and nut assembly 51. Upon rotation of the nuts the shaft is displaced which, in turn, displaces the link 47 and adjusts the ram 38 relative to the roll assemblies. Such adjustment is employed in the initial installation of the assembly so that the proper relationship can be established between the ram 38 and the roll 12.

In the particular illustrated form, the required movement to extract the rolls from the mill and place them in the roll-changing position in front of the mills is approximately 17 ft. while the length of the rack is 8-½ ft. so that, in effect, the present invention has reduced the length of the extractor approximately 50 percent.

There will now be briefly described the operational sequence of the disclosed extractor. Let it be assumed that the pair of rolls 12 is in the mill, as illustrated in FIG. 1, and the extractor assemblies 22 and 23 are in the positions illustrated, also in FIG. 1. It will be appreciated that the necessary preliminary operations preparatory to presenting the rolls in a position for roll changing have been performed so that the cylinders 46 can be raised to allow the upper rams 38 on the operation of the motor 28 to be brought into an abutted relationship with the projection of the bearing chock assembly of the roll 12. Once this occurs, the motor is once again operated whereby the pinions 25 drive the middle rams 32 towards the roll stand at the same time the chain is driven so as to move the upper rams 38 actually through the roll stand to extract the roll from the mill, thus causing the rams to assume the position shown in FIG. 3, which is their fully extended position. During the movement through the mill, the roller 42 of the carriage 41 and the roller 44 of the middle ram 32 will be supported by rails, such as shown in phantom in FIG. 1, or by some other well-known means.

When a pair of new rolls is to be reinserted into the mill, the cylinders 46 are operated to engage the hooks with the roll 12,

after which the motor 28 is again operated, but in a reverse direction, and the rams are brought to the position shown in FIG. 2 in which the new rolls are caused to assume the position shown in FIG. 1.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof.

I claim:

1. In combination with a rolling mill having an operating side and a driving side and including at least a pair of roll assemblies, a roll assembly moving means for moving at least one of said roll assemblies into and out of said mill comprising:

a roll assembly engaging means,

three superimposed rams including a stationary ram having means for supporting a second ram and permitting relative movement between said stationary ram and said second ram, said second ram having means for supporting said third ram and permitting relative movement between said second ram and said third ram,

said rams being arranged on the drive side of said mill and wherein the aggregate length of the rams are such as to allow the roll assembly engaging means to be advanced from said drive side to the operating side of said mill,

said roll assembly engaging means carried by said third ram,

means for effecting said relative movements of said second and third rams to advance said second and third rams from a contracted position where the rams are positioned over each other and where the roll assembly engaging means is on said drive side of the mill to an expanded position where said second and third rams are moved away from said first rams and where the roll assembly engaging means is brought to said operating side of the mill.

2. In combination with a rolling mill in accordance with claim 1, including a rack and pinion assembly for drivingly interconnecting said stationary ram and said second ram,

a sprocket and chain assembly for drivingly interconnecting said second ram and said third ram, one end of said chain being connected to said third ram, and

means for connecting said roll engaging means to the end of said ram adjacent the mill.

3. In combination with a rolling mill in accordance with claim 2 wherein said pinion is rotatably mounted on said stationary ram and said rack is mounted on said second ram,

said means for moving said one ram including a power means connected to said pinion for driving said pinion, and

said sprockets comprising a pair of spaced-apart sprockets mounted on said second ram adapted to support said chain.

4. In combination with a rolling mill in accordance with claim 3 including means mounted on said third ram connected to said chain for adjusting said third ram relative to said second ram.

5. In combination with a rolling mill in accordance with claim 1 wherein said roll assembly engaging means comprises a carriage,

a wheel mounted on said carriage engaging with a rail arranged in a plane parallel to the axis of said roll assembly.

6. In combination with a rolling mill in accordance with claim 5, including a support roller mounted on said second ram in a manner to overhang said stationary ram and engaging with said rail.

7. In combination with a rolling mill in accordance with claim 1 wherein said roll assembly is driven by a spindle arranged in axial alignment with the roll assembly and wherein said roll moving means comprises two separate means mounted on each side of said spindle and in planes parallel thereto,

said means for moving said second and third rams including a common power means for advancing said two separate means in unison.

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